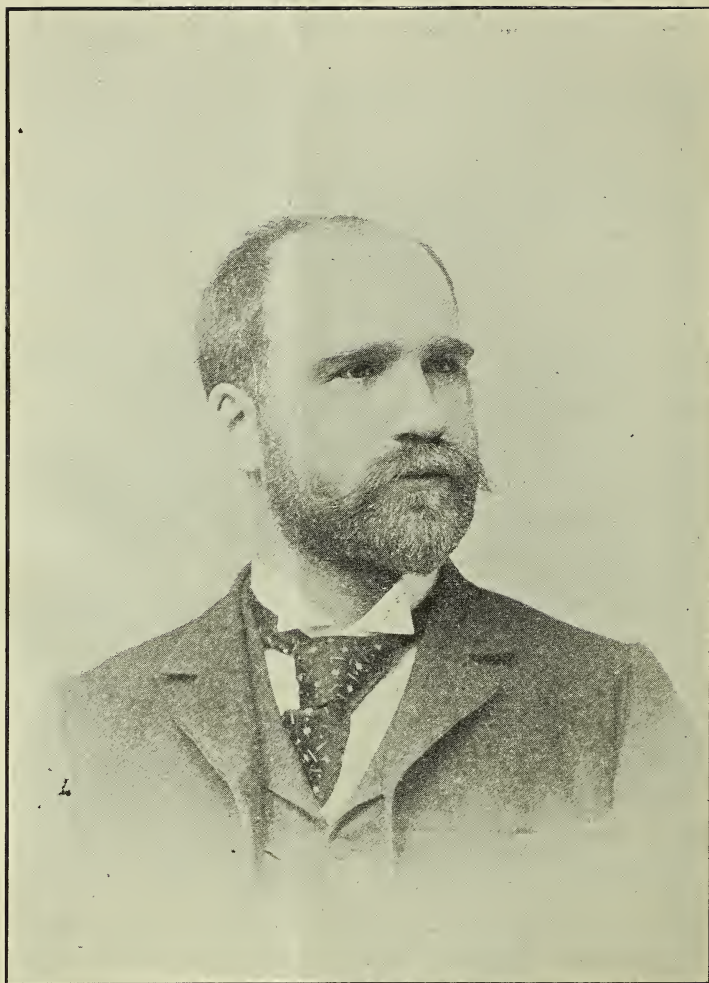


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J. WARREN SMITH,
Section Director, Weather Bureau.
[See page 86.]

THE AGRICULTURAL STUDENT.

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EDITORIAL CHAT.

In spite of all that has been done by our agricultural colleges, experiment stations and the agricultural press throughout the country, toward the promulgation of scientific principles as applied to the feeding of stock, the fact still remains that an immense amount of money is annually thrown away by improper methods of feeding. The following taken from the *Farm, Stock and Home*, serves to show the magnitude of this loss in a single county:

Some months ago the Freeborn County Times gathered the statistics from the creameries of that county showing the business done by each. Among them are some of the best and oldest creameries in the county, and it is not unreasonable to assume that the cows were handled and fed much better than the general average, and probably as well as they are anywhere in this country.

Assuming that all the figures are correct, it appears that the average annual yield per cow in the best dairy region of Minnesota is only 3,523 pounds of milk and 157 pounds of butter. The average yield of common cows during three years at the Minnesota Experiment Station has been 5,916 pounds of milk and 293 pounds of butter. Sta-



tistics show that during the three years creamery patrons received net 15 cents per pound for butter. So they received for the 157 pounds \$23.55 gross income for butter per cow. There is no doubt but that these cows would have yielded at least 275 pounds on the average under proper feed and care, or 118 pounds additional per cow, which would have brought an income of \$41.25 each. In many instances the proper feed would not be more expensive than the kind that was fed. But assuming that the providing of food adapted for milk production would increase the annual food cost \$5 per cow, and it would not be more, and making allowance for this extra cost, there remains an annual loss of \$12.70 per cow because of improper feed and care. There were 14,097 cows contributing milk to the thirteen creameries, making a relative annual loss to their owners of \$179,031.90. There are, however, twenty-eight creameries and two cheese factories in Freeborn county that received during the year 87,683,731 pounds of milk, and estimating that the cows not reported yielded as much milk as those did, it appears that there are in Freeborn county 24,891 cows whose milk is taken to factories and the total loss in the county at the rate of \$12.70 per cow would aggregate \$296,215.70. If the state would provide a good instructor in feeding in every county it would be money wisely expended and would return an hundred fold.

The Grout bill imposing a tax of ten cents a pound on colored oleomargarine and reducing the tax on uncolored oleo, has passed the House by a decisive vote of 198 to 92. Considerable opposition to it will probably be developed in the Senate, but the dairymen generally feel confident of a final victory.

The enrollment for the Ohio Dairy School on December 22, more than two weeks before the time for opening, was fifty-three. This is an increase of almost one hundred per cent. over the total attendance of any previous year. Let the good work go on.

The Ohio Dairymen's Association will be held in Townshend Hall early in February. The official program is not yet announced, but we are assured that a number of noted speakers have been secured to address the meeting and that a fine display of dairy products will be one of the features.

We note with pleasure that Perdue University is falling into line with O. S. U. and other progressive Western universities in the matter of teaching domestic science. Mrs. Nellie Skedzie, of Kansas State College, has been chosen to be at the head of the new department.

C. A. Clawson, B. Sc., 1899, and D. V. S., 1900, who recently passed the civil service examination, has been assigned to duty as assistant meat inspector at Kansas City. There are now six O. S. U. graduates serving as government inspectors at Kansas City.

What Kind of Machine Shall I Buy?

It is often remarked that our agricultural colleges ought to do something towards settling the question of the selection of farm machinery. Something is being done along this line at the Ohio State University. Students in the four year courses are required to work a thesis and many of the students in Agriculture have chosen subjects along the line of farm machinery. The writer is one of this number and has undertaken to make some investigations with regard to the durability of twine binders.

It has been claimed by some companies that while their machines do their work no better than others that they are better constructed and would, in consequence, be more durable. Every year added to the life of a worthy machine, like a binder, means considerable to the owner. In order to aid in the determining of this question, the readers of THE AGRICULTURAL STUDENT are solicited to answer the questions indicated below. We expect to get a large number of reports, and if so, it is thought they will be of considerable value. The larger the number of reports, the more valuable it will be. We trust as it is for your interest and the interest of your fellow farmers that we are making this comparison, you will be prompt in filling out and forwarding answers. Do not put it off until you forget it. It will require but a moment to do it now.

As many persons have had more than one machine we ask you to name each machine which you have used; how many years you have had each in operation; how many acres have been cut with each machine. Give actual acres, if possible, and if not, estimated acres. Any further information concerning the care the machine has had, cost of repairs on it and the weak points about it, will be very gladly accepted. Kindly mail your answers to J. C. Perry, Botanical Hall, Ohio State University, Columbus, Ohio.

The Splendid Agricultural Career of a Former O. S. U. Student.

Probably no name connected with the practical study of horticultural and agricultural questions is better known in the country to-day than that of Prof. Willis G. Johnson, State Entomologist at the Maryland Agricultural College. He has engaged widely in the work indicated, and in the study of economic

problems pertaining to the farm and orchard. Professor Johnson spent two years at the Ohio State University, where he gave special attention to scientific agriculture. Later he was graduated from Cornell University, and following this was engaged for two years at Stanford University as Assistant in the Department of Entomology, where he had unexcelled opportunities for research along his chosen lines. Leaving Stanford, he engaged in entomological work at the Illinois State University, and was subsequently called to the Maryland Agricultural College, where he has been for nearly five years.

As an example of what may be accomplished through great persistence, Prof. Johnson must serve as an inspiration to many young men who have like worthy ambitions. While at the Ohio State University preparing for college, he worked on the farm at whatever he could get to do. Cutting, planting or digging potatoes, weeding, hoeing, cutting and even shucking corn. This was done during the extra hours he had at his disposal outside of studies and other duties. While at Cornell University he wholly supported himself and gave assistance to a brother, by managing a boarding club, writing for newspapers, acting as a book agent, selling typewriters, etc. In California, Illinois and Maryland he has written many popular articles on agricultural topics for the daily press. His more general articles have appeared in agricultural, horticultural and various trade journals. Since his arrival in Maryland, four and a half years ago, he has built a department from a dusty table and a chair, with no organization, to one of the best-equipped of its kind in the country.—Orange Judd Farmer.

J. Warren Smith.

J. Warren Smith was born at Grafton, New Hampshire, September 21, 1863, and spent the early years of his life working on the farm and attending the district school at Grafton. He prepared for college at Colby Academy and entered the New Hampshire College of Agriculture and Mechanical Arts, which was then associated with Dartmouth College, in the fall of 1885, and graduated from that institution three years later with the degree of Bachelor of Science. Soon after his graduation in 1888 Mr. Smith was enlisted in the Signal Corps of the army and assigned to duty as assistant weather observer at Boston, serving at that station and at Cambridge, successively as observer, assistant director of the New England Meteorological Society, observer in charge of the Boston office of the Weather Bureau, and finally as director of the New England Weather Service. While at Cambridge as assistant director of the New England Meteorological Society, Mr. Smith was associated with Professor William Davis, and took two years' work in meteorology under him in the Lawrence Scientific School.

In the summer of 1897 Mr. Smith was sent to Montana to take charge of the station at Helena and the Montana section of the climate and crop service, but was transferred the next year to a similar position at Columbus, Ohio. While in Helena he arranged for the extension of the special storm warnings' service of the Weather Bureau, into Montana in the interests of the sheep and cattle men. The practical utility of such warnings was demonstrated the first season by the saving of thousands of dollars worth of sheep and cattle that would have perished but for these timely warnings which enabled the cattle men to take the necessary precautions

to protect their herds against the fury of the storms.

During his stay in New England the present system of forecast distribution from sub-stations by mail was developed at Augusta, Maine, and has since extended to all parts of the United States.

In the winter of 1899-1900 the forecast distribution to agricultural communities by the carriers on the rural free mail delivery routes was recommended and carried into effect by Mr. Smith. Eighteen of these routes have already been established, and forecast cards are being distributed daily to nearly two thousand rural families. Besides this the Columbus office has under its supervision the sending out of more than seven thousand forecasts by mail, telegraph and telephone.

During the spring term of 1899 at the Ohio State University Mr. Smith delivered a series of lectures on Meteorology to the students in agriculture and horticulture. These lectures were so popular that they have since been incorporated into the regular courses as a part of the required work. During the whole time of his service at Columbus Station, Director Smith has enthusiastically identified himself with the agricultural interests of the state and has left nothing undone that would contribute to the advancement of the cause of agriculture. Although the duties of his office allow of only occasional absences from the city, he has allowed his name to be placed on the list of available speakers for Farmers' Institutes, and during the past two years has delivered a number of lectures throughout the state. The marked improvement of the weather service in this state during the past few years and the recognition that it is now being given to the needs of rural communities in the matter of daily forecasts are strong testimonials of the qualifications and ability of the present section director.

The Students' Trip to the Live Stock Exposition at Chicago.

Professors Hunt and White and a party of twenty Agricultural and Veterinary students of the O. S. U. attended the great live stock show at Chicago during the first week in December. The party reached Chicago Thursday morning and spent the day in looking at the various exhibits and attending the public auction sale of Aberdeen-Angus cattle which, together with a large part of the exposition, was held in Dexter Park amphitheatre where the daily horse market of Chicago is held. The building has a seating capacity of 3,000 and accommodations for several hundred head of cattle. Thursday evening was spent attending the exhibition of saddle horses and Hereford cattle. Friday was spent at the Union Stock Yards making a special study of the methods of handling, selling and shipping. These great stock yards cover several hundred acres of ground and require the services of more than 4,000 men. Saturday morning was spent in Armour's packing works where there are daily slaughtered 12,000 head of hogs, and 1,600 head of cattle representing a daily outlay of \$200,000.

There was on exhibit at the international show more than 10,000 animals, including horses, cattle sheep, swine, etc., and there was paid out \$75,000 in premiums. There were 730 entries of breeding cattle; 279 entries of horses; 50 exhibitors of sheep and 45 exhibits of hogs aside from the fat hog exhibit. Of the cattle exhibit the Herefords led with 188 entries, followed by Shorthorns, 167; Polled Durhams, 72; Red Polls, 59; Angus, 13; Devon and Sussex, 9, and grade cattle, 147. In the horse department the Percherons led with 91 entries, then came Clydesdales with 60, Shires with 33, Belgians with 15, and French Draft with 9 entries,

Two of the most notable events of the exposition were the sale of the champion yearling steer for \$1.50 per pound, and the sale of the prize Hereford cow at public auction for \$3,160.

Something Regarding Remedies for Horseflies.

Among the various insects which are an annoyance to farm stock in summer is a group of several species which receive the common name of horseflies. Hot sunshine is most agreeable to them, consequently they are most abundant during the middle of the day. The larvæ live in water or mud for at least a part of the time, and feed on the immature stages of other insects largely. Many of the species deposit their eggs on foliage that overhangs the water. Usually small ponds and artificial lakes are selected by them as suitable localities for egg-laying, and along the banks of such waters their egg clusters are so common at certain times in the year that it is practical to gather them by hand and destroy them; and I have often thought that mowing the plants near the water's edge and removing them to a safe distance from the pool would produce good results.

Not many remedies have been suggested for horseflies, but I have been much interested in one published not long since in Bulletin 20, of the U. S. Division of Entomology. The paper, although not dealing exclusively with American species, gives suggestions which may be used against horseflies wherever they are found. It is known to those who have observed the actions of the adult flies around pools that they strike the water at intervals for the purpose of sipping the liquid. Knowing this habit a Russian observer conceived the idea of putting kerosene on the surface of stagnant pools for the purpose

of trapping the flies. Since his results were so striking I consider it worth while to quote from an English translation of his work.

The insects in attempting to take in water by the proboscis, were at once wetted by the kerosene and became stuck, as it were, to the surface of the pool. In their efforts to tear themselves away from the oily surface by the aid of their wings, they circled with great velocity on the surface of the water and soon perished. In some cases, not at all infrequently, they succeeded in flying away, but in all such cases they let themselves down on the leaves of bushes near by, or they flew farther with a peculiar unequal buzz. Their fate was only postponed a few hours. They soon perished from suffocation and poisoning, so that at different distances from the pool could be found dead or dying flies, whose bodies were more or less covered with kerosene. The observer found that on account of the strong flight of the flies one pool treated with kerosene in a locality was visited by great numbers of the insects, even from the vicinity of other pools, and is of the opinion that the application of this means of exterminating horseflies may entirely free a locality from them, especially if the pools to be treated are well selected and operations began as soon as the insects appear and continued until their disappearance.

J. S. HINE.

The latest census report places the center of population of the United States at a point a few miles west of Columbus, Ind. In 1790 the center of population was 23 miles east of Baltimore, and since that time it has moved steadily westward, not varying more than half a degree north or south of the original position.

The Importance of Water as a Factor of Plant Growth.

"Oh, for a rain! The ground is all creased with great cracks that follow a hundred turns and clouds of dust, the treasures of the farm, rise at the least breath of air."

Such has been the experience of the farmers throughout the northern sections of the United States for the last three years or more. What does it mean? It means that as Mother Nature turns her wheel of changes, partially to the clang of the mechanic's sledge, and the buzz of the woodman's saw, the farmer of the land is brought face to face with new conditions, with new problems to solve. The greatest of those problems is the supply of water to his crops at the proper time and in proper amounts.

Were it possible to say that any one element or combination of elements required for plant growth is more essential than any other we would most assuredly designate water as that one. Chemically speaking water is a combination of only two elements, while thirteen are required by growing plants. Though constituting fifty to ninety per cent. of all growing vegetable tissue it is at the same time the carrier for the remaining eleven elements. The rootlets of plants take up water by reason of certain force inherent in the living cells, and it is conducted through the tissues, finally being given off into the air by the leaves. In general it may be said water is only taken up by the roots and hence must have been in contact with the soil particles.

Of the thirteen essential elements ten of them are derived from the soil. In the soil they exist in two states, the soluble and insoluble, with reference to water of a slightly acid nature. So the water passes in and out among the soil particles, the soluble portions of the elements are dissolved and carried along

to the rootlets and through these to all parts of the plant, where it is needed. In preforming this carrying function just referred to the fact must be borne in mind that aside from its use as a nutrient water to the amount of from three hundred to four hundred times the weights of the dry tissue must pass through the plant. In this we get some idea of the demand.

For the eastern and central sections of the country the data of the different weather bureau stations indicate that the total number of inches of water which fall upon the ground in the form of rain and snow is practically constant from year to year. Here opens a new phase of the question. The distribution of those inches must be the vital factor. Now, what we need to "scratch our heads" about is how to correct nature's irregularities.

In arriving at some definite conclusion regarding the control of soil moisture it will be necessary to look for a moment into the relation which soil water sustains to the soil particles.

In the soil the water exists as a delicate film enveloping each particle and held in place by two forces, one acting between the part of the film and the soil, the other acting between the different parts of the film. The first is known as adhesion, the second as surface tension. These forces only act through insensible distances, and hence the greater the thickness of the film the less stable the outer particles of the water envelope. In practical agriculture it is the aim to retain only that water which will remain attached to the soil particles, and which will not drain away as through tiles or other means of conduction. More water than this produces what is known as a "water-logged soil," driving out the air which condition is not conducive to ordinary plant activities.

If the water exists only as a film on the

surface of the particles, then the greater the surface the greater the capacity to retain moisture. Such is the condition of affairs. And the surface area of the particles varies inversely as their diameters. Then, the smaller the diameter the greater the surface, and the more water that will be retained. Referring to general observation, the greater amount of water that will be retained by a fine sand or clay loam as compared with gravel, is well known, and the same law holds for all sizes of soil grains. It must not be forgotten in this connection that a number of particles may be united so closely into an aggregate as to act as a single large particle, and herein lies one of the troublesome questions before the soil physicist.

Now, as to the means by which the favorable conditions outlined above may be correlated with existing meteorological conditions.

There are two ways by which the capacity of many soils to retain moisture may be increased. (1) By thorough and deep plowing with careful surface culture. (2) The incorporation of organic matter in the soil.

Deep plowing may be either subsoiling or turning a deep furrow. Subsoiling has not always met with favor and very many farmers oppose turning a furrow because it brings to the surface large amounts of soil never before exposed to the vitalizing rays of the sun, but we believe that in so doing they are speaking in direct opposition to the teachings of their own fields. Different farm crops vary in their habits of rooting and the same crop varies in different soils. Some are naturally deep rooters and draw their needed elements from as great a depth as they can penetrate. The shallow rooted plants may be enticed downward by a plentiful supply of plant food or water, but if only the surface four or five inches are moved there is

little inducement for them to go beyond that depth. In clayey soil the sub-strata will be compact, cold and resistant to plant roots. There will be little circulation of air and comparatively little water holding power about it. But, turn up at each plowing an inch or two of this sub-soil; expose it to the light; cultivate it on the surface that the air may have access to its every part, and shortly you will find that you have unlocked a mine of fertility and the process should be continued until the plow reaches a depth of ten or even twelve inches. The action of the air and the sun will be to disintegrate the soil particles, reducing their size and hence increasing their power to retain moisture. Instead of five inches of soil for a reservoir, you have ten, and are therefore able to withstand a correspondingly extended drouth.

By deep plowing the organic matter is carried to a greater depth. It is common to say that organic matter in the soil acts as a sponge for retaining moisture. Plant tissue is made up of a succession of cavities or cells, and in the soil these cavities may become gorged with water or their thin walls may act as trestle work to hold the soil particles apart allowing free movement of air and water and at the same time increasing the surface by their thin walls. Then to, by its disintegration, organic matter gives rise through various organisms to organic acids, which are powerful in their action on the mineral elements changing them from the insoluble to the soluble forms and at the same time reducing the size of the soil grains. All these various processes work together for the benefit of the growing plant and the enrichment of the farmer. Even sub-soiling, while it does not mix the sub-strata with the surface soil, opens it for the more free action of air which reduces their size and in other ways affects them.

Having provided a suitable reservoir the farmer has next to look for a cover to prevent the water from escaping by the surface, and volumes of experience in this line point to shallow but frequent culture as the cheapest and most effective. A light mulch is what is wanted, and it should always be kept loose that the force of capillary action may be lessened and water retained. Only general rules can be given for bringing about such a condition, but with a knowledge of the underlying principles and the effectiveness of different tools the farmer may unite them to bring about the desired results. In other words the farmer must study his own conditions, must be on the ground and using his brain, for in the future it will be brain and not so much brawn, that will make for success in agriculture, as it has crowned the efforts in the systematized mechanical industries.

E. O. F.

The Relative Value of Different Kinds of Fuel for Cooking.

A knowledge of fuel is essential to the practical housekeeper, for in no other one material is so large a waste likely to occur, and through no other can so great a saving of labor be effected. Coal bills can be much reduced by proper building and management of fires, and a great amount of work saved by substituting gas for coal.

Probably every housekeeper of fifty years ago was aware of the fact that there is a great difference in the heating power of different kinds of wood. Now-a-days when wood is hardly used except for kindling, few of us know that for that purpose a mixture of hard and soft wood, of oak and pine, for example, is advantageous, or that, for a fire made entirely of wood, shell-bark hickory gives the most intense heat, white oak next, and so on down the scale. The value

of wood as a fuel depends greatly upon its dryness. Green wood gives little or no heat, because the heat is used up in converting the sap into steam. Even after two years of natural seasoning wood may contain from 20 to 30 per cent of water.

Probably fifty years hence coal will be as little used as wood now is; but for the present a great many of us must or will use this dirty and undesirable fuel. If coal is used it should be bought but once a year, partly because one can sometimes buy it cheaper in bulk and in the summer or early autumn than in winter; but chiefly on account of the work of cleaning the cellar, and sometimes the whole house and grounds, which inevitably attends the getting in of coal. Before allowing soft coal to be unloaded it is wise to have it well sprinkled with water. This lays the dust so that the coal can be shoveled without causing so much dirt as it otherwise would. A careful manager will have coal bins of known capacity in her cellar, as a protection against a possible unscrupulous dealer. A bin of about 38 1-2 cubic feet will hold a short ton—2000 pounds. A bin of 43 cubic feet will hold a long ton—2240 pounds, though, of course, a given bin will hold more nut coal, which packs down tightly, than soft coal, a large part of which comes in good sized lumps. A mixture of what is known as white-ash anthracite and red-ash anthracite is the very best kind of coal for stoves and ranges, but the price of it is so high that most persons use soft coal instead. In any case the character and quantity of the ashes should be observed, as these give an indication of the quality of the coal, which cannot be detected before it is burned. Ashes are mineral matters which are not combustible, and hence a very large percentage of ashes shows that the coal is poor.

Coal often contains not only sub-

stances which produce inert ashes, but others which are injurious to the grate or lining of the fire box, and often some which give off noxious gases. Among the most deleterious of these impurities is lime, which acts as a flux with part of the ashes and forms clinkers. When these are noticed adhering to the lining of the fire box, they should be removed at once. This usually cannot be done by poking, but if a thick layer of oyster or clam shells be put on a red-hot fire, the shells will be converted into quicklime, which will loosen the clinkers.

Mrs. Helen Campbell says: "If fires are properly made and kept, fuel bills can be lessened fully half." She gives the following directions: "After having raked out and dumped all ashes, make your fire by putting in paper and wood loosely and opening every draught. As soon as the wood is well on fire, cover with about six inches of nut coal. When the coal is burning brightly, shut up all the dampers, save the slide in front of the grate, and you will have a fire which will last without poking for four hours." Excessive supplies of air to fires waste their heat, and too little air causes smoke and soot, which is worse than waste, especially in stoves and ranges, where it clogs the flues and acts as a non-conductor of heat to the oven. Never allow the coal to come above the edge of the fire box or lining. If you do, ashes will fall into the oven flues there to choke the draught and absorb the heat. Moreover, stove covers which otherwise would last for years, if allowed to rest on red coals, become warped and burned out in an incredibly short time.

The Germans have devised a plan for burning bituminous coal, slack, saw-dust and other inferior forms of fuel and waste without smoke, and under conditions of extreme economy. This is done by forcing through a hollow grate enough air into the pulverized fuel to

cause it to be all burned up, giving off no smoke; but yielding a regular heat. Adoption of this method would be extremely valuable for ships in time of war since smoke enables an enemy to locate a vessel, and would also do away with the smoke from factories in our cities, besides reducing the cost of fuel to one-fourth that of ordinary coal. For household use, however, oil and especially gas and electricity, are sure to supersede coal.

For cooking, oil is cheaper than coal, and nearly as convenient as gas. Miss Morrell tells, in the *Kitchen Magazine*, how she kept house for herself with two, two-burner kerosene oil stoves and a tin oven, at a cost of fifteen cents a week for oil. Any one who has tried an oil stove would not be without one, even if she uses a coal stove for cooking most things. "The only advantage of a chafing dish over a kerosene stove and a spider, is its beauty," says Miss Morrell. Kerosene costs only about a third what alcohol does, alcohol being one of the dearest and most unsafe of fuels. A pint of ethyl-alcohol costs 50 cents. Methyl, or wood alcohol, to be sure, is somewhat cheaper—30 cents per pint, and its fuel value is the same as that of ethyl alcohol, but the unpleasant odor which it gives off when burned, makes it undesirable.

Mr. Edward Atkinson claims great things for his 'Aladdin Oven,' cooking in which is done by means of kerosene. He says that cooking and lighting for a household of ten persons for one hundred days was done with seven dollars worth of kerosene when that oil was selling for fifteen cents a gallon. The economy in fuel he considered of the least importance, compared to the economy in the use of food material and the quality of the result of the application of heat under absolute control.

There is no doubt regarding the com-

fort, convenience and safety of a gas cooking stove. Gas is clean, instantly lighted and extinguished, requires no storage space, leaves no refuse and little labor and skill are required to manage it. Concerning its economy, however, there are conflicting opinions and no rule can be laid down for all localities, since the price of gas varies so much in different places.

When illuminating gas was used and \$1.40 per 1000 feet was paid, one woman estimated that a breakfast for five people could be gotten with an expenditure of a cent and a half for gas. Since natural gas has been discovered and the price in Columbus, at least, has dropped to 20 cents per 1000 feet, gas bills for cooking and lighting for an ordinary family vary from \$1.50 to \$2.00 per month.

It is true that the natural gas supply is being rapidly exhausted; but it is also true that a cheap gas artificially produced from the waste materials of mines will eventually take its place. Such gas is being produced at Scranton, Pa., and late inventions have so facilitated its manufacture that it can now be made at a cost of nine cents per 1000 feet. The cost to the consumer will vary according to circumstances, such as the distance of his residence from the gas plant. Gas, though doing away with the drudgery of coal, has its disadvantages. Active currents of air put it out, and the air of rooms in which it is burned very soon becomes vitiated. Those who use gas for cooking are in danger of literally drying up. The woodwork and furniture of a house very soon show the effects of its dry heat. To counteract this a vessel of some kind filled with water should always be kept over one burner of a gas fire, or should hang before the gas fire if it is in a grate.

Superior even to gas is electricity, which Mr. Tesla promises us in the near

future as freely as water. Though as but little used for cooking, it has been successfully applied to ranges, cooking utensils, irons and the like, as shown in the electrical kitchen at the World's Fair. Located in the new hospice building of the Carmelite Fathers, on the Canadian side overlooking Niagara, is a kitchen containing an electric combination range and three electric ovens. The heating surface of this range is six square feet and each square foot of surface is controlled by a separate switch, so that full or half heat may be turned on by means of the switch. The cook says that she has had experience with coal and gas, but in electricity she has found the ideal kitchen service.

The following table gives an idea of the relative value of some fuels:

	Units of Heat.	%C.	%H.	%O.	Ash.	Cost per Ton.
* Hydrogen.	34460					
Carbon	8080					
Hard or Anthracite Coal.	6000	92	2	2 1-2	1 1-2	\$6.50
Lignite.	5000	64	5	26 in water.	4	\$2.50
Canuel Coal. (Large lump, Comes from Va.)	5000	75	5	13	2	\$4.00
Bituminous. Soft Coal. (Named from the tars which it produces.)	5000	83	5	8	1	Pea, \$1.75 Nut, 2 25
Caking Coal. (Dirty.)	5000	87	5	8	1	\$1.50
Petroleum.	10397					
Alcohol.	7182	22 2-9	66 2-3	11 1-9	—	\$0.50 per pint.
Wood Alcohol.	7000	16 2-3	66 2-3	16 2-3		\$0.30 per pint.

* Hydrogen gives a hot blue flame, but little light. Carbon gives a glow with-
out flame. H. and C. give flame and light. Oxygen contained in fuels is inert. Ashes are non-combustible mineral mat-
ters.

A New Food Plant for Stock.

Within the last few years the Rape plant has become a favorite stock food with many of the cattlemen of this country, but more especially with the sheep-raisers. The plant is a biennial and grows about two feet high. The leaves are of a glaucous or whitish green color, the lower ones being shaped somewhat like those of the wild cabbage, and die off when the plant comes in bloom. Little is known of its early history, but it is thought that it was grown by the Romans, although the writings of their naturalists and agriculturalists are too vague to establish the fact with much certainty. The plant has long been grown in Europe for its oleaginous seeds which yield by expression about thirty-three per cent. of oil suitable for lubricating machinery after having been freed from its impurities. But it has been only within comparatively recent years that it has been grown to any extent in this country. The method of cultivation in Europe is to raise the plants in a seed-bed, and then plant them out in rows like cabbage, but in the United States it is grown almost exclusively as a forage crop, for which purpose it seems highly adapted. Rape succeeds well upon land freshly broken up from pasture, a circumstance which led to its extensive growth upon the alluvial flats of Lincolnshire and Essex, where the farmers were in the habit of paring and burning the turf and sowing Rape without any other preparation, until the landlords found that the soil was being exhausted and made clauses in their leases to forbid its cultivation unless fed off by sheep.

On rich ground the leaves often rise four feet in height, completely hiding the sheep that are feeding on them. The plant is occasionally grown for the purpose of green manuring being ploughed

under after the leaves have nearly attained their full development, and, although they contain much nitrogenous matter this can rarely be profitably adopted. The cake that remains after the oil has been removed from the seeds is used both for cattle feeding and as manure. Rape, however, reaches its highest usefulness when used as a soiling crop, making a most excellent green feed for sheep that are being kept in the barn during the warm summer months.

E. L. S.

The Annual Report of the Secretary of Agriculture for 1900.

In his annual report which will be issued soon, Secretary Wilson declares that his aims are to bring the department scientists to the help of the producers, to ascertain what we import that they can produce, with a view to encouraging trade; to search the world for grains, fruits, grasses and legumes that they may be domesticated here and be an improvement on what we have; to secure new and improved varieties of plants by cross fertilization; to co-operate with the experiment stations in all the States and Territories in research of practical value to the people of all sections; and to seek out new markets for our surplus products.

Mr. Wilson emphasizes the manner in which this department differs from others. He says its appropriations should be regarded as an investment, for the reason that it makes direct returns therefor by adding to the wealth of the country, thus adding yearly largely to the profits of the farmers and others as the result of its investigations. He instances as money-saving or money-making agencies the Weather Bureau; the meat inspection; the pathological investigations of plants; the services of the entomologist; the services of the de-

partment on behalf of the sugar and tea industries, of the orange industry, which owes its beginning and its preservation to this department, of the tobacco industry, and others.

Then taking up the work of the department in more detail, he reviews the operations of its several branches.

Weather Bureau.—Many important extensions of the weather service have been made during the past year. The efforts of the bureau were especially directed toward the investigation of methods of electrical communication without wires with a view to establishing communication between vessels at sea and exposed points on our lake and sea coasts. Already messages have been transmitted and received over 60 miles of land, and it is believed that such instruments will operate successfully over several hundred miles of water.

Much stress is laid upon the continued improvement of the forecast service and the value of its warnings. He points out that, notwithstanding the great number of crafts plying the Gulf of Mexico at the time of the Galveston storm, the warnings were so timely that there was no disaster upon the open waters.

Bureau of Animal Industry.—The number of abattoirs and packing houses receiving the benefit of inspection this year was 148 in 45 localities, as against 138 in 41 localities last year.

During the quarantine season of 1899 over a million cattle were moved under the supervision of the Bureau from the district infected with the Southern cattle tick. In Texas alone, over 357,000 cattle were inspected for shipment to other sections. The sheep industry has suffered greatly from sheep scab, and much time and attention have been given to securing its control and eradication. Results so far are encouraging, and the Secretary believes that a few

more years of earnest work will effectually eradicate the disease. Over 1,800,000 sheep were inspected, and nearly 627,000 dipped under the supervision of the inspectors.

Considerable space is given to the consideration of tuberculosis, "the most prevalent and most destructive disease affecting mankind and the domesticated animals." A great increase in the disease is noted in the principal countries of Europe, especially, unfortunately, in those whence American breeders desire to obtain animals for improving their stock. Arrangements have been made to station an inspector in Great Britain to test and certify to the animals before shipment. The suggestion is made that uniform regulations under Federal authority will save shippers much annoyance and loss, owing to the numerous restrictions imposed by individual States, and at the same time furnish adequate protection.

With regard to rabies the Secretary declares that this disease is unfortunately on the increase in the United States, and that local authorities have in most cases not efficiently controlled its outbreaks. He refers especially to its existence and increase in the District of Columbia, and points out the special danger to children from rabid dogs.

Experimental shipments of dairy products are still continued, and shipments of butter have been extended to Cuba and Porto Rico.

The secretary earnestly recommends an inspection of dairy products designed for export. He points out the example of other countries, whose large foreign trade in dairy products has been principally developed owing to the fact that their best products bear a government stamp, guaranteeing the article to be as represented.

Division of Chemistry.—Elaborate work in the investigation of food adul-

terations has been carried on and active co-operation has been had with other bodies, notably the Pure Food Congress, in an effort to secure legislation on the subject of food adulterations.

The investigation of the sugar beet industry has been prosecuted with vigor and intelligence.

Division of Entomology.—The most satisfactory work of this department was the introduction into California of the insect which fertilizes the Smyrna fig. The result will be to make America a strong competitor in the world's fig market.

Division of Botany.—Especial attention is called to experiments with American clover seed, which have shown that the American seeds are decidedly more valuable than the European.

Seed and plant introduction receives extensive notice, special stress being laid upon the importations of cereals.

In concluding this subject Secretary Wilson cites the introduction of wheats from Russia, Hungary and Austria, greatly exceeding in yield our present varieties, and points out that if, as the result of these introductions, the wheat yield of the United States should be increased by but one bushel per acre, this would mean at the farm price for wheat in 1899, an addition of \$26,000,000 to the income of our framers.

Division of Vegetable Physiology and Pathology.—This work is now divided into five important branches, namely, plant pathology, plant physiology, Pacific coast investigations, plant breeding and plant nutrition and fermentation. The Secretary believes that excellent results will be obtained from the systematization of the work of this division. In corn breeding the features aimed at are early maturity, drought and smut resistance, increased protein content, and a large yield. Diseases of the sugar beet

have been investigated, also diseases of forest trees.

Division of Pomology.—The most important work of the year in this line was the establishing and maintaining at the Paris Exposition of an exhibit of horticultural implements, seeds, plants and fruits. This exhibit attracted wide attention, and the Secretary believes its ultimate effect will be most beneficial to American producers.

Division of Agrostology.—This work has also been divided into several sections and thoroughly systematized. As a result of experiments in Texas, the grazing of pastures has been so much improved that, where three years ago they were estimated as capable of supporting one steer to 16 acres, they will now maintain in good condition one steer to 8 acres, a gain of 100 per cent. The grass garden on the department grounds, containing nearly 500 varieties, has been maintained, and seeds of some 200 varieties have been distributed.

Division of Gardens and Grounds.—The Secretary refers in most complimentary terms to the late Mr. Saunders, so many years in charge of this and other important branches of the department work. Considerable space is given to tea production in the United States and to the opportunity this industry affords of utilizing the labor of colored children in the South, while at the same time affording them a good education. The claim is made that it has been demonstrated that tea can be produced in the United States for family use in gardens and also on a commercial scale.

Forestry Work.—There has been a great growth in this work, which is of such a kind as to fully justify additional resources. Moreover, there has been an enormous increase in the demand, both public and private, for services of this character throughout the country. The relations of the Division of Forestry with

practical lumbermen and tree planters have been closer and more useful than ever before. The total membership of the force at the highest last summer was 125. The public interests in forest matters is not only keener and wider than at any time before, but it is growing with rapidity beyond precedent.

Public Road Inquiries.—There is much inquiry in all sections of the United States regarding better roads and better methods of building them. It has been deemed wise to divide the country into four sections, and to appoint in each an expert agent. This has been done, and one appointed in the Eastern States, one in the Southern, one in the prairie States, and another in the Rocky Mountain States. These gentlemen are to study the needs of these several sections, give instruction as to road building, and report regularly to the department. They will, moreover, supply samples of road material for analysis and testing, a testing machine having been arranged for in the laboratory of the Division of Chemistry, to be operated by an expert under the joint supervision of the Director of Road Inquiry and the Chief Chemist.

Much work has been done in the past year in co-operating with the colleges and stations and the people of the several States in building experimental roads.

Office of Experiment Stations.—The Secretary reviews at considerable length the work of the experiment stations first established in this country twenty-five years ago.

Progress is noted in the experiments conducted in Alaska and the establishment of substations is recorded.

As the result of investigations in Hawaii and Porto Rico, the Secretary believes that experiment stations should be established in these dependencies, and that they should receive for this

work an annual appropriation equal to that given to the other territories.

A special study has been made of the conditions under which the water for irrigation is owned, distributed and used.

The Secretary calls attention to the fact that on the supply of water for irrigation and its equitable distribution depends the permanent existence of civilized life in one-third of the area of the Union.

Section of Foreign Markets.—The study of markets abroad with special reference to extending the demands therein for the agricultural products of the United States has been prosecuted with zeal and intelligence. From the records of this section we derive most satisfactory information as to the development of our agricultural exports.

During the past fiscal year Cuba, Porto Rico, the Hawaiian Islands and the Philippines furnished a market for \$45,000,000 worth of our domestic products. Five years ago these islands took but \$13,000,000 worth. During the fiscal year 1900 we sold to these islands \$20,000,000 worth of farm produce, an increase of \$13,700,000 over 1896.

The Agricultural Exhibits at the Pan-American Exposition.

Among the twenty or more great buildings which will shelter the multitude of exhibits at Buffalo next year, the Agricultural building ranks as the largest. It is situated on the north side of the Mall, opposite the Manufacturers' Building, and is 500 feet long by 150 feet wide. It is very ornamental in its exterior aspect, having broad, high entrances richly adorned with appropriate plastic work. The southern facade is characterized by an open loggia which forms an attractive resting place or a promenade from which the

crowds upon the Mall may be observed. The roof of red tile with broad overhanging eaves will harmonize with the softer tints of the exterior walls. The broad cornice is to be particularly rich in its decorative detail.

The exhibits to be shown in the Agricultural Building will embrace every possible phase of agricultural work, showing the advantages of different processes and methods of work and the products of the garden and field in their great variety produced under all sorts of conditions. The Superintendent of this division is Mr. Frank A. Converse, of Woodville, N. Y., a stock-grower and farmer of thorough experience in exposition work and who is prominent in institute work on behalf of the New York State Department of Agriculture. Mr. Converse is receiving the co-operation of many prominent associations and individuals and his correspondence at this early date indicates a most comprehensive exhibit of scientific farming in all its branches.

Under the classification of agricultural systems will be shown methods of fertilization including the use of cover crops, commercial fertilizers, crop rotation, systems of soiling, with bulletins, statistics, addresses and exhibitions of crops raised by the use of particular fertilizers. Under the classification of farm management and processes the different systems will be illustrated with the view of assisting farmers to determine whether it is best to keep a variety of stock or a particular breed and, if but one kind, which shall be favored. The question of farm help and the different specialties in the way of fruit, grain and truck farming will be treated exhaustively. The experience of a large number of farmers under many conditions of the soil, climate, etc., will be brought together for the information of

all who may wish to learn. Under the classification of agricultural statistics will be presented reports from different States and provinces issued by the departments of agriculture, live stock and dairying associations showing the aggregate of crops and products of all kinds. Under the head of cereals will be exhibits from different States and localities, wheat, rye, oats, barley, corn, buckwheat and rice. The exhibits will be arranged to prove which crop is best designed for each State or locality. These exhibits will show the many varieties of cereals in their highest stage of development.

In tubers and root crops will be displays of beets, turnips, carrots, peanuts, potatoes, sugar beets, parsnips, onions, etc. In October a special potato display will be made showing the products of many States in comparison with one another. Farmers who are interested in the production of sugar beets will have an invaluable opportunity to learn about the wonderful development of this particular vegetable. A special display will be made of sugar beets, showing all varieties and making clear to everyone the conditions under which they thrive best, including both soil and atmosphere. The necessity of abundant sunshine in the maturing of sugar beets and the absence of it at the proper season have been the causes of serious loss and discouragement to growers. The value of various by-products for food for live stock will be shown in various exhibits of gluten meal, linseed meal, cotton seed meal, hominy meal, and other prepared foods. The display of grasses and forage will include all varieties, the purpose being to show the ones best adapted for farm uses with reference to particular soils and conditions. The proper mixture of seed for permanent pastures, meadows, lawns,

etc., will be explained. The displays of vegetable fibers will include flax, jute, hemp, cotton and their different products. The fibers of animal origin will include hides, hair, wool, silk, and the processes of preparing them for market. Among the non-edible products of animal origin to be exhibited are glue, gelatine, stearine, wax candles, bone and horn products, fertilizers, etc. The question of fertilizers is always an important one to those who seek to obtain the best results from the soil. In the treatment of this subject the Division of Agriculture will endeavor to show the relative value of the natural fertilizers both crude and compounded. It will bring to the information of all the sources of nitrogen, guano, offal, phosphate rocks, potash, nitrate, etc. As a sort of catch-all for many things impossible to classify the superintendent has set apart a separate class. Under this head will come such things as Japanese millet, broom corn for feed, the peppermint and other crops raised for a variety of purposes.

The important industry of bee-keeping will have adequate representation. Very useful knowledge has been developed in recent years in regard to this branch of farm work and by reason of this better knowledge larger profits are being realized by those who make use of it. The exhibits in this class will show the localities and conditions in which and under which honey bees thrive best. The uses of bees for other purposes than honey—such as the fertilization of flowers by reason of carrying the pollen from one flower to another—will be shown. There will be displays of a variety of hives, the different feeds for bees, the effects of their use, and the commercial forms of honey. The different varieties of bees will also be shown and the methods of management in apiaries.

A special exhibit will be made of models and drawings of farm buildings. The specifications will also be given so as to make these exhibits of immediate and practical value. These will show the best buildings as determined by their arrangement for the comfort of animals, convenience of handling stock, feeding, lighting, safety, sanitation and ventilation. The importance of ventilation is so little understood that very few farm buildings are provided with a system that affords fresh air in abundance among the stock without the accompaniment of chilling drafts that often prove dangerous and costly.

Among the exhibits will also be a demonstration of agricultural work in colleges. This will be made particularly interesting to young men who propose to devote themselves to farming. The exhibits will consist of models, literature and methods showing the work in different lines and special courses of college work. The agricultural college has become an important institution in many of the States and in no line of work can a scientific knowledge be turned to better account than in agriculture and its allied industries.

New Books.

THE GREAT BOER WAR. By A. Conan Doyle. McClure, Phillips & Co., New York. Cloth, 12 mo., 478 pp., with six maps in color. Price, \$1.50.

Dr. Doyle has gained a world-wide reputation as a writer of fiction, but he has now produced a volume which will stand as a witness to his powers as a historian. He served several months as surgeon in South Africa during the war, and thus has been able to secure his facts first handed. "To the strict impartiality of the historian he adds the warmth of a novelist's imagination, and the result is a book which will be read with the keenest pleasure for long days to come."

CHAPTERS ON ANIMALS. By Philip G. Hamerton. Edited by Prof. W. P. Trent. D. C. Heath & Co., Boston. Paper, 15 cents.

This little book is one of Heath's home and school classics and is intended for boys and girls from ten to fourteen years of age. It is substantially bound in tough paper and illustrated by splendid drawings after noted animal artists.

THE REAL CHINESE QUESTION. By Chester Holcombe. Dodd, Mead & Co., New York. Cloth. Price, \$1.50.

Mr. Holcombe was connected with the United States Legation at Peking, as interpreter, and in other capacities, from 1871 to 1885; and since that time has been connected with various enterprises in that country. His long residence in China and his close association with those high in the government, make him especially qualified to write of Chinese affairs. This new book deals especially with the peculiar character and conditions of the Chinese people that have led up to the recent uprising against the foreigners. The volume contains many facts that must be painful and humiliating to the civilized nations, but true, nevertheless. The author appeals not for China, but for fair play.

EXPANSION UNDER NEW WORLD CONDITIONS. By Rev. Josiah Strong. The Baker & Taylor Co., New York. Cloth. Price, \$1.00.

At the threshold of the new century the United States is confronted by conditions which are new in the history of the world. It is in the light of these new conditions that this book on Expansion is written. The author recognizes the fact that mankind has not yet reached that stage in which physical conditions have ceased to dominate in shaping the course of events. With the change of physical conditions must come a change of our national policy and a profound alteration of our inter-

national relations. The author approaches the subject from an economical standpoint, and the book as a whole presents a fair and logical treatment of the case.

EBEN HOLDEN, *A Tale of the North Country.* By Irving Bacheller. Lathrop Publishing Co., Boston. 12 mo, gilt top. Price, \$1.50.

A new and charming novel dealing exclusively with American life, and especially with those sturdy types of country folk who, having subdued the wilds of the North Woods, went out to save the nation during the stormy times preceding and during the great civil war. The book is a simple but charming recital of life in the north country, its invigorating mountain atmosphere, and the humor, rugged character and wisdom of the plain country people.

The author also brings in some stirring scenes of city life in which Horace Greeley, the great editor, is a leading character. Readers of Eben Holden can readily see why its sale during the last has been so remarkable as to have exhausted six editions since July.

ELEMENTS OF PHYSICS. By Henry A. Rowland and Joseph S. Ames, of Johns-Hopkins University. American Book Co., Cincinnati, O.

It is now being recognized that to attempt to teach physics without lecture experiments, is almost worse than useless. In Part I of this book the authors have emphasized the most important laws of the various branches of Physics, and in Part II, under Suggestions to Teachers, descriptions are given of lecture demonstrations and laboratory experiments which are suited to illustrate the facts and theories given in Part I. The names of the authors are a sufficient guarantee for the accuracy of the statements given in the text.

MOTHER NATURE'S CHILDREN. By Allen Walton Gould. Ginn & Co., Boston. Cloth, 250 pp. Price, 70 cents.

This fascinating little book for the young, aims to show the spirit rather than the form of nature. The author brings out forcibly the mutual dependence of animals from the lowest to the highest forms by choosing such subjects as are capable of being illustrated. Each chapter contains a number of pictures bearing directly upon the text. How birds, plants and mammals cradle their babies, and how seeds and birds learn to fly, are some of the interesting things told in this little book.

HOW TO LIVE A HAPPY LIFE. By G. H. Alford, of Mississippi. The Saalfeld Publishing Co., Akron, Ohio. Paper. Price, 35 cents.

This little book purports to be an account of Willis, the Model Farmer, and contains much valuable advice which is particularly directed toward the southern farmer, but much of which is equally applicable to the farmers of our own state. Among other things it tells of Willis' choice of a profession, his choice of an education and his practical working policy, after having chosen a farm and a wife.

DAINTY BREAKFASTS. By Phyllis Browne, with a Tabular Introduction by A Mere Man. Cassell & Co., Limited, New York.

A handy little volume of 140 pages, containing breakfast recipes arranged in alphabetical order and accompanied by an exhaustive index. For the convenience of the housewife lists of dishes are classified under the headings: "Made-up Breakfasts," that is, breakfasts made from cooked fragments, Night Before Breakfasts, or breakfasts wholly or partially prepared over night, and Ten-minute Breakfasts, or breakfasts which can be quickly prepared.

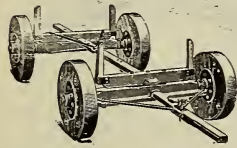
SOME NEW IDEAS IN WAGONS.

If the farmers of this country would profit by all that has been said to them through the columns of the Agricultural Press, by the Lecturers at Institutes, the recommendations of various Agricultural Colleges and Experiment



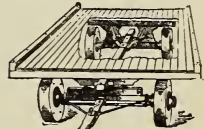
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Stations, there would soon be but few farms without a low-down, broad-tire, short-turning, flat-platform truck. Such a truck offers many advantages. Here are a few of them: You can get on your fields earlier in the spring and after a rain. They draw easier because



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at either end; like a turtle's shell, its platform is its own cover. The next time your wagon cuts a rut and gets stuck in the field, don't get angry at your horses because they can't pull, but at yourself, for not having at least one wagon about the place with six-inch tires. Remember that low wheels on your old



wagon do not give either the short turn nor the flat platform. The latest catalogue with full information and prices concerning Handy Wagons and Metal Wheels for your old wagons will be sent you free by the Farmers' Handy Wagon Co., Saginaw, Mich.

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